The Taxonomy of the semi-communal Spiders commonly referred to the Species *Ixeuticus candidus* (L. Koch) with Notes on the Genera *Phryganoporus, Ixeuticus* and *Badumna* (Araneae, Amaurobioidea)

M. R. GRAY

GRAY, M. R. The taxonomy of the semi-communal spiders commonly referred to the species *Ixeuticus candidus* (L. Koch) with notes on the genera *Phryganoporus, Ixeuticus* and *Badumna* (Araneae, Amaurobioidea). *Proc. Linn. Soc. N.S.W.* 106 (3), (1982) 1983: 247-261.

Phryganoporus Simon 1908 is synonymized with *Badumna* Thorell 1890. The synonymy of *Ixeuticus* Dalmas 1917 with *Badumna* is supported. Spiders previously placed in the genus *Phryganoporus* or the species *I. candidus* (L. Koch) are referred to either *B. candida* (L. Koch), *B. gausapata* (Simon) **n. comb.** or *B. vandiemeni* **n. sp.**; these three species form the *candida* species group of the genus *Badumna*. Biological notes are given.

M. R. Gray, Department of Arachnology, The Australian Museum, P.O. Box A285, Sydney South, Australia 2001; *manuscript received 1 September 1981, accepted for publication in revised form 17 February 1982.*

INTRODUCTION

Several authors have considered the taxonomic status of the semi-social amaurobioid spiders described by L. Koch (1872) as *Amaurobius candidus* from Queensland and Simon (1908) as the genus *Phryganoporus* from Victoria and Western Australia. However, at present these spiders are usually referred to the genus *Ixeuticus* as a single species, *I. candidus* (L. Koch). They are widely distributed in open forest and woodland habitats where their communal webs are usually built in low tree or shrub foliage. Occasionally, heavy infestations occur in orchards or shrubland pastures; the extensive webbing can severely inhibit foliage growth and prevent grazing.

TAXONOMIC BACKGROUND

Three species were originally recognized within *Phryganoporus* Simon 1908: *P. gausapatus* (Simon 1906) from Victoria (originally described in *Amaurobius* C. Koch) with a subspecies, *P. g. occidentalis* Simon 1908 from Western Australia; *P. nigrinus* Simon 1908 and *P. tubicola* Simon 1908 from Western Australia. *Amaurobius candidus* L. Koch 1872 had previously been described from Queensland and was later transferred to *Ixeuticus* Dalmas 1917 by Roewer (1954). This placement has been followed by most subsequent authors (McKeown, 1963; Dondale, 1966; Hickman, 1967; Main, 1971, 1976). Dondale (1966) redescribed *I. candidus* but the description and figures given were of a related species *I. martius* (Simon 1899). As a result of this confusion Leech (1971, 1972) suggested that *I. martius* may be a junior synonym of *I. candidus*. In fact, as previously noted by Lehtinen (1967), *I. martius* is a junior synonym of *Amaurobius longinquus* (L. Koch 1872) also referred to *Ixeuticus* by Dalmas (1917).

Lehtinen (1967) retained the genus *Phryganoporus* to which he transferred *I. candidus* to create the new combination *P. candidus* (L. Koch). Lehtinen also synonymized

two of Simon's species, *P. gausapatus* and *P. nigrinus*, with *P. candidus* but retained *P. tubicola* Simon.

Subsequently, Main (1971) synonymized all of the species formerly described in *Phryganoporus* into a single widely distributed species, *I. candidus*.

The Generic Problem

Lehtinen (1967) synonymized *Ixeuticus* Dalmas 1917 (type species *A. martius* Simon 1899 described from New Zealand but probably introduced from eastern Australia) with *Badumna* Thorell 1890 (type species *B. hirsuta* Thorell 1890 from Java, Indonesia). Subsequent authors have not followed Lehtinen (Forster, 1970; Main, 1971, 1976; Leech, 1971, 1972). Only Leech (1972) supported his rejection of the synonymy, arguing first that *I. martius* lacks functional tarsal claws on the female palps whereas *B. hirsuta* has definite, pectinate palpal claws as noted by Thorell (1890) and second that the anterior median eyes of his *I. martius* were largest whereas Thorell indicated that the anterior and posterior median eyes of *B. hirsuta* were subequal. However, all females of *I. longinquus* (syn. *I. martius*) examined by me possess well-developed palpal tarsal claws with seven to ten pectinations; and while the A.M.E. were usually the largest, this was not the case in all of the specimens examined or in other species of *Ixeuticus*. Kulczynski (1908) provides an excellent description and figures of *B. hirsuta*. These indicate clearly that the genitalic characteristics (male palp and female epigynum) of this species are extremely similar to those of *I. longinquus*. Consequently, Lehtinen's synonymy of *Ixeuticus* with *Badumna* seems entirely valid.

One result of this has been a change in the name of a very common and widely distributed species, the black house spider. Previously *Ixeuticus robustus* (L. Koch), Lehtinen (1967) synonymized it with *Amaurobius insignis* L. Koch 1872, so creating the new combination *Badumna insignis* (L. Koch).

Main (1971) noted the inadequacy of the characters used by Simon (1908) as a basis for maintaining the separation of *Phryganoporus* and *Ixeuticus*. By placing all species of *Phryganoporus* into *I. candidus* Main effectively synonymized the two genera but retained the junior synonym, *Ixeuticus*. The position of *Badumna* was not considered here.

In contrast, Lehtinen (1967) retained *Phryganoporus* while recognizing the synonymy of *Ixeuticus* and *Badumna*. His criteria for the retention of *Phryganoporus* relate mainly to spination and the structure of the male palp. However, specimens examined by me do not support the spination differences cited; representatives of both *Phryganoporus* and *Badumna* (**sensu** Lehtinen) have a rather constant pattern of ventral metatarsal spination of 221, whereas ventral tibial spination varies widely in *Phryganoporus* (010 to 222) and is not an adequate generic character.

The male palpal tibia of *Phryganoporus* is stated by Lehtinen to possess a single basodorsal (= retrodorsal basal) process. However, there is also a retroventral process which is equivalent to that present in *Badumna* species. Two or three retrolateral to retrodorsal palpal tibial processes are commonly present in *Badumna*. These may be placed apically as in *B. longinquus* or basally as in *B. inornata* Simon. Lehtinen also cites the basally protruding tegulum of the *Phryganoporus* male palp as a generic character; however, this feature simply represents the accentuation of a character trend already apparent in *Badumna* species. Unlike *Badumna, Phryganoporus* may possess a patellar process but this is not significantly developed in all species.

Similarities in male palpal morphology between *Phryganoporus* and *Badumna* are readily apparent. Both possess an S-shaped, spiniform embolus, a distally tapering, marginally folded conductor and a spoon-shaped, membranous median apophysis. The female genitalia also share a common pattern consisting of an anterior fossa

bounded posteriorly by a prominent, transverse ridge with lateral teeth present. The internal genitalia of *Phryganoporus* species show a consistent pattern that is very similar to that of *B. longinquus* (Fig. 20).

Both genera share a similar tarsal organ and trichobothrial plate morphology (Figs 23-28). Both also possess a complex, strongly branched tracheal system confined to the abdomen. This presents a marked contrast with another related, but distinct genus, *Forsterina* Lehtinen, which possesses a simple (unbranched) tracheal system. The latter finding is of wider interest because it suggests that for the Australian fauna this character may be usable at generic level only, whereas it has been used at the superfamily level by Forster (1970) and Forster and Wilton (1973) to separate their Dictynioidea and Amaurobioidea. One anomaly evident from this is their placement of the related genera *Ixeuticus* and *Reinga* Forster, a close relative of *Forsterina*, into different superfamilies.

In summary, the features used by Lehtinen to maintain *Phryganoporus* seem inadequate to justify its separation from the large and rather variable genus *Badumna*. The only unequivocal character at present available to *Phryganoporus* is its possession of a single retrodorsal tibial process on the male palp compared to two or three in *Badumna*. However, the tibial processes seem to be rather labile characters, both in shape and number, in these spiders. Behavioural traits may be valid generic characters but the social behaviour shown by members of *Phryganoporus* does not seem of special significance — social tendencies are apparent in members of *Badumna* also e.g. *B. socialis* (Rainbow).

Consequently, I think it justifiable to consider *Phryganoporus* Simon, like *Ixeuticus*, to be a junior synonym of *Badumna* Thorell. A generic revision of *Badumna* would certainly require the delineation of either subgeneric or species group categories. Here, the spiders formerly placed within *Ixeuticus candidus* (L. Koch) or *Phryganoporus* Simon are regarded as forming the *candida* species group within the genus *Badumna*.

Badumna Thorell

Badumna Thorell 1890: 322.
Type species: *Badumna hirsuta* Thorell 1890.
Phryganoporus Simon 1908. N. syn.
Type species: *Amaurobius gausapatus* Simon 1906
Ixeuticus Dalmas 1917.
Type species: *Amaurobius martius* Simon 1899

Badumna candida species group

Three species are recognized here: *B. candida* (L. Koch), a widespread, variable species found in Queensland, New South Wales and South and Western Australia. *B. gausapata* (Simon) from southeastern Australia; and *B. vandiemeni* n. sp. from Tasmania.

Diagnosis

Medium sized (carapace length 2.4 to 4.1 mm) cribellate spiders which live in both communal and solitary webs. Carapace silvery brown in colour, white hairs abundant. Abdomen light brown with a dark brown mid-dorsal stripe followed by several light to dark brown chevron markings with white hair tufts laterally. Legs banded brown and grey. Anterior median eyes or anterior lateral eyes largest. Cheliceral teeth, retrolateral 2-4, prolateral 3-5. Cymbium large, broad. Embolus of male palp sinuously curved (S-shaped), proximal part of tegulum strongly protuberant basally. Male palpal tibia with a retrodorsal basal and a retrolateral ventral process;

dorsal patellar process well developed or rudimentary to absent. Epigynum with a prominent, subdistal, transverse ridge posterior to an unpaired fossa; lateral teeth distal to subdistal. Tracheal system complex, confined to abdomen.

Repositories: Australian Museum (A.M.); Queensland Museum (Q.M.); Tasmanian Museum and Art Gallery (T.M.); Zoologische Museum, Hamburg (Z.M.H.); Museum National d'Histoire Naturelle, Paris (M.N.H.N.); Australian National Insect Collection (A.N.I.C.).

Badumna candida (L. Koch), new comb. Figs 1-11, 23, 35-37
Amaurobius candidus L. Koch 1872
Phryganoporus gausapatus occidentalis Simon 1908
Phryganoporus nigrinus Simon 1908
Phryganoporus tubicola Simon 1908; Lehtinen 1967
Ixeuticus candidus Roewer 1954; Main 1971
Phryganoporus candidus Lehtinen 1967

Diagnosis

Patellar process on male palp rudimentary to absent; median apophysis directed apico-laterally. Lateral teeth of epigynum distal; fossa widest in central to posterior half. Cheliceral teeth, retrolateral 2-4 and prolateral 3-5. Ventral tibial spination, first leg 010-222. Metatarsal trichobothria; first leg 4-5.

MALE (S 144, Q.M.)

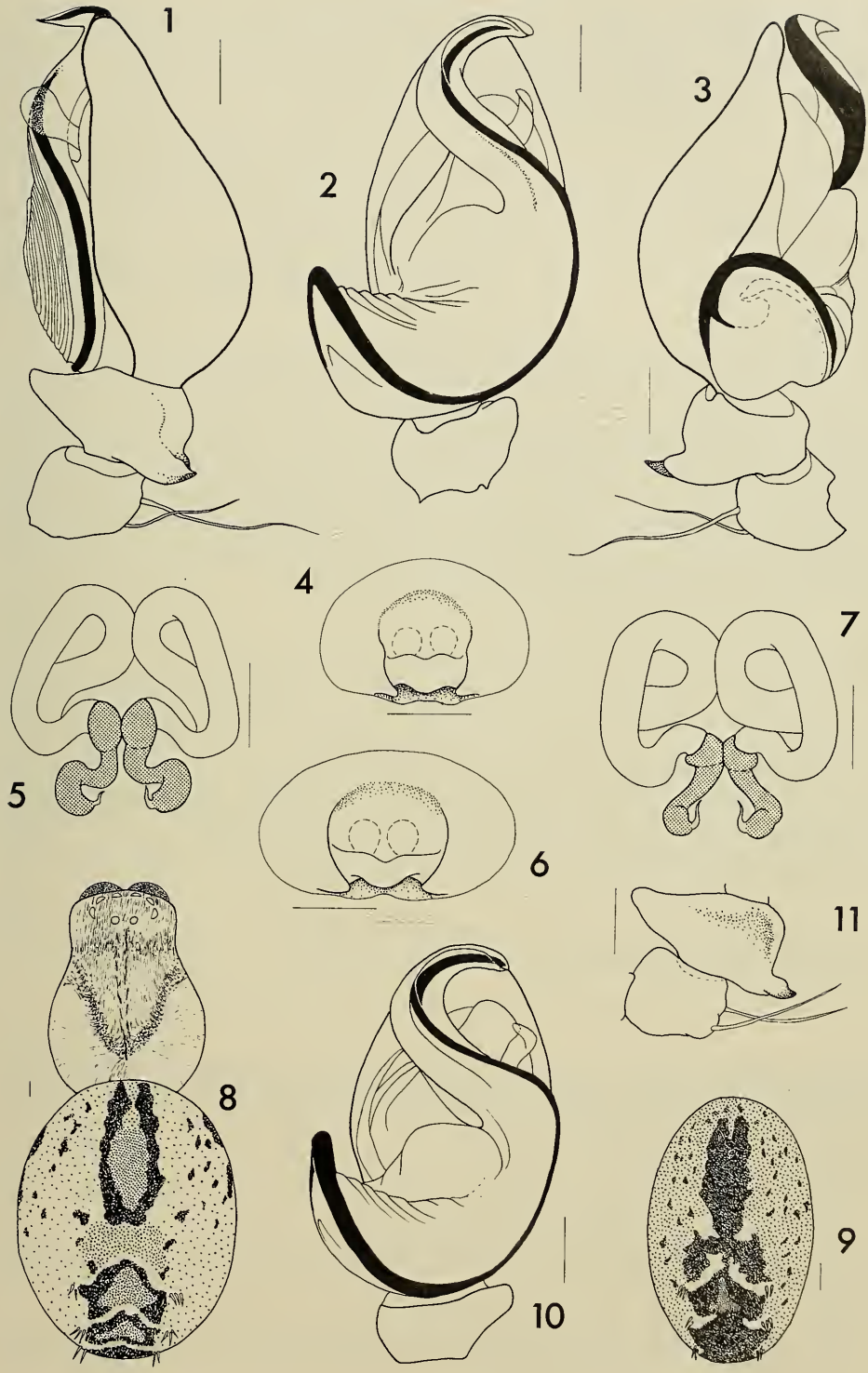
Measurements (mm): Body length 5.68. Carapace length 2.58, width 1.90. Abdomen length 3.10, width 2.11.

Colour: Carapace silvery brownish-grey with numerous white hairs; brown patches lateral and posterior to the fovea. Chelicerae and sternum dark brown, the sternum with dark brown hairs only. Legs with silvery grey and brown bands; ventral surfaces of coxae with white hairs. Abdomen light brown with a broad, dark brown mid-dorsal stripe, paler centrally and less than half as long as abdomen, bordered by lateral patches of white hairs. Immediately posterior to this stripe is a light brown patch partly delimited anterolaterally and posterolaterally by four dark brown spots. Behind this is a row of five to six dark brown chevron markings, paler brown centrally, which are separated from each other by thin lines of white hairs which form white hair tufts laterally. Dark brown flecks are present on the lateral abdomen particularly lateroventrally where they form a more or less distinct longitudinal dark line. This is separated on each side by a moderately broad line of white pigment from a broad, dark brown midventral stripe running between the epigastric fold and the spinnerets.

Carapace: Longer than wide in ratio 1:0.74. Clypeus height about 1.5 times the diameter of an A.M.E. Cephalic area well developed, fovea a narrow slit.

Eyes: A.L.E. > P.L.E. > A.M.E. ⩾ P.M.E. in ratio 1:0.86:0.73:0.71. Interdistance ratios, A.M.E. - A.M.E. 0.50: A.M.E. - A.L.E. 0.69: A.L.E. - P.L.E. 0.27: P.L.E.

Figs 1-11. Badumna candida. 1-3 male palp; 1, retrolateral; 2, ventral; 3, prolateral. 4-7, female genitalia: 4, epigynum, 5, internal genitalia (Girraween N.P., Qld); 6, epigynum, 7, internal genitalia (Brookton, W.A.). 8, female, dorsal. 9, male abdomen, dorsal (dark colour morph). 10-11, male palp (TYPE of *P. tubicola*): 10, ventral: 11, tibia and patella, retrolateral. Scale lines 0.2 mm.


1
2
3
4
5
6
7
8
9
10
11

- P.M.E. 1:P.M.E. - P.M.E. 0.92. M.O.Q. length, anterior width, posterior width ratio 0.97: 0.81:1. Lateral eyes slightly protuberant. From above, anterior eye row slightly recurved, width 0.88 mm; posterior eye row slightly procurved, width 0.96 mm. The A.L.E., P.L.E. and P.M.E. all have broad, band-like tapeta, diffuse in A.M.E.

Chelicerae: Boss present. Fang groove with 2-3 teeth on retromargin, 3-4 on promargin.

Maxillae: Subparallel, slightly convergent, twice as long as wide.

Labium: Wider than long in ratio 1:0.79. Widest subbasally, shallowly notched apically and basolaterally.

Sternum: Cordate, shortly pointed posteriorly; longer than wide in ratio 1:0.87.

Male palp: Cymbium short and broad, bulb large. Tegulum and proximal embolus protrude strongly basally on the prolateral side. Embolus a large, sinuous, S-shaped spine supported by a similarly sinuous, folded membranous conductor, both ending retrolateral-ventral to the apex of the cymbium. Median apophysis membranous, broad, spoon-shaped and, in ventral view, directed apicolaterally. Tibia with a blunt retrolateral-ventral process directed ventrally and a pointed retrodorsal basal process directed retro-dorsally. Patellar process indistinct to absent.

Legs: 1243. Spination: Leg 1, femur p 011, d 112, tibia p 11, r 11, v 122 or 022, metatarsus p 11 or 12, r 11, d 02 or 12, v 221; leg 2, femur p 011, d 112, tibia p 11, r 11, d 012, metatarsus p 11, r 11, d 12, v 221; leg 3, femur d 113, tibia p 11, r 11, v 012, metatarsus d 11, r 11, d 112, v 221; leg 4, femur d 112 or 113, tibia p 11, r 11, v 112, metatarsus p 011, r 001, d 222, v221. Calamistrum weak. Tarsal claws: superior with 9-11 pectinations; inferior with 2-3 pectinations. Hairs ciliate. Trichobothria: single row on tarsus and metatarsus; tarsus of first and second legs with 5, others with 3, placed in central half to third; metatarsus of third leg with 5, remainder with 4, placed in distal three quarters to half, or distal quarter on fourth leg. Bothria collariform with fine, longitudinal striae on proximal plate.

Tracheal system: Complex, consisting of four strongly branched tubes confined to the abdomen; spiracle of moderate width, as wide as cribellum.

Cribellum: Bipartite, spinning area reduced, strongly sclerotized posteriorly.

Spinnerets: Six, short. Anterior lateral pair broad, conical, basally approximated with a very short distal segment: posterior lateral pair thinner and slightly longer, the distal segment one-third of the total length.

FEMALE (S 144, Q.M.)

Similar to male except as indicated below.

Measurements (mm): Body length 7.00. Carapace length 2.84, width 2.04. Abdomen length 4.42, width 3.43.

Eyes: A.L.E. > A.M.E. = P.L.E. > P.M.E. in ratio 1:0.92:0.92:0.87. Interdistance ratios, A.M.E. - A.M.E. 0.40: A.M.E. - A.L.E. 0.61: A.L.E. - P.L.E. 0.16: P.L.E.

- P.M.E. 1: P.M.E. - P.M.E. 0.89. M.O.Q. length, anterior width, posterior width ratio 0.99:0.78:1.

Chelicerae: Fang groove with 4 teeth on retromargin, 5 on promargin.

Labium: Wider than long in ratio 1:0.84.

Sternum: Longer than wide in ratio 1:0.81.

Palp: Tarsal claw with 8-9 pectinations.

Legs: 1243. Spination: leg 1, femur p 011, d 112, tibia p 11, r 11, v 122, metatarsus p 011, r 011, d 012, v 221; leg 2, femur p 011, d 112, tibia p 11, r 11, v 112, metatarsus p 011, r 011, d 112, v 220 or 221; leg 3, femur d 133, tibia p 11, r 11, v 012, metatarsus p 011, r 011, d 212, v 221; leg 4, femur d 112, tibia p 11, r 11, v 112, metatarsus p 011, r 001, d 122, v 121 or 221. Calamistrum well developed and occupying the proximal to central half of the metatarsus. Tarsal claws: superior with 9-11 pectinations; inferior with 2-3 pectinations. Trichobothria (legs 1 to 4): tarsus 5, 4, 4, 4; metatarsus 5, 3, 4, 4. Bothria collariform with several poorly defined ridges curving medially from the lateral margins of the proximal plate and converging upon its base. Tarsal organ an oval opening situation at the distal side of a low, mound ornamented with a few indistinct semi-circular folds; tarsal organ mound poorly delimited and about three times longer than opening.

Cribellum: Bipartite, sclerotized posteriorly and at median partition, spinning areas well developed, spigots strobilate.

Genitalia: Epigynal fossa a rounded depression about as long as wide, widest centrally to posteriorly. Fossa bounded posteriorly by a broad, transverse, chitinous ridge; anterior margin of ridge indented. Lateral teeth distal to ridge. Internal genitalia with broad, singly coiled seminal ducts; receptacula small and adjacent near mid line; a broad, curved fertilization duct extends posteriorly.

Holotype female: Amaurobius candidus L. Koch 1872 from Bowen, Queensland, Australia. Zoologische Museum, Hamburg. Araneae type cat. no. 11. Museum Godeffroyi cat. no. 7852.

Material examined

HOLOTYPE female, Bowen, Qld (Mus. Godeff. 7852, Z.M.H.). Male and female (S 144, Q.M.), Southwood, 30km west of Moonie, Qld, R. Raven; 24.8.1973; from communal web. 2 males and 4 females (Q.M.), Girraween National Park, nr. Stanthorpe, Qld. Male (KS 6941, A.M.), 'Burnside', near Margaret River, W.A., M. Gray, 26.1.1979; taken as juvenile in solitary web. Female (KS 6938, A.M.), Torbay, W.A., B.Y. Main 10.10.1977. Female (KS 6939, A.M.), Brookton, W.A., B.Y. Main, 5.5.1977. Male (Ar 811, M.N.H.N.), TYPE of *Phryganoporus tubicola* Simon, Denham, W.A. Male (KS 6937, A.M.), Wanaaring, N.S.W., 28.3.1977; taken as juvenile from communal web. Female (KS 6940, A.M.), 21km east of Parkes, N.S.W., M. Gray, 8.4.1972; from solitary web. 6 males, 10 females (KS 5089, A.M.), 6km east of Dubbo, N.S.W., M. Gray, 21.8.1980; from communal web. 7 females, 1 male (KS 8663, A.M.), Kimba, Eyre Peninsula, S.A.

Variation

Measurements (mm): Males: carapace length 2.44-2.88, width 1.65-2.10. Females: carapace length 2.84-3.80, width 2.04-2.54.

Colour: Sternum with brown or brown and white hairs.

In addition to normally pigmented spiders a colour form with increased melanic pigmentation occurs in southwest Australia. As adults these spiders have a dark brown carapace and the light brown patch normally placed immediately behind the mid dorsal abdominal stripe is replaced by a dark brown chevron marking (Fig. 9). The lateral abdominal areas are silvery grey in colour. These spiders correspond well with Simon's *P. nigrinus* from Boyanup, W.A., here synonymized with *B. candida.* Subspecific status may prove appropriate for this distinctive colour morph.

Chelicerae: Retrolateral teeth 2-4, prolateral teeth 3-5.

Spination: Leg 1, ventral tibia 010-222.

Genitalia: Epigynal fossa as long as wide or wider than long; lateral margins evenly or unevenly curved.

Badumna gausapata (Simon 1906), new comb. Figs 12-18, 26

Amaurobius gausapatus Simon 1906
Phryganoporus gausapatus Simon 1908
Phryganoporus candidus Lehtinen 1967
Ixeuticus candidus Main 1971

Similar to *B. candida* and agreeing with the description given for that species except as indicated below.

Diagnosis

Definite patellar process on male palp; median apophysis directed apicolaterally. Lateral teeth of epigynum subdistal; fossa widest in central to posterior half. Cheliceral teeth, retrolateral 2-3 and prolateral 5-6. Ventral tibial spination, first leg 112-222. Metatarsal trichobothria, first leg 5-6.

MALE (KS 6942, A.M.)

Measurements (mm): Body length 7.05. Carapace length 3.45, width 2.61. Abdomen length 3.60, width 2.31.

Colour: As for *B. candida*. Sternum with brown and white hairs.

Carapace: Longer than wide in ratio of 1:0.76. Clypeus height equals 1.25 diameters of an A.M.E.

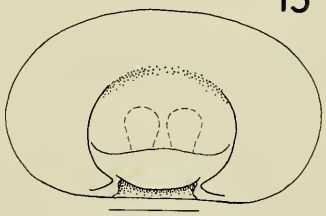
Eyes: A.M.E. $\geqslant$ P.L.E. $\geqslant$ A.L.E. > P.M.E. in ratio 1:0.98: 0.96: 0.83. Interdistance ratios, A.M.E. - A.M.E. 0.38: A.M.E. - A.L.E. 0.53: A.L.E. - P.L.E.

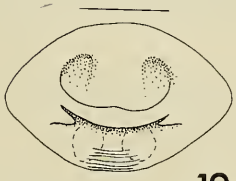
Figs 12-18. Badumna gausapata. 12-14, male palp: 12, retrolateral; 13, ventral; 14, prolateral. 15-17, female genitalia (SYNTYPES): 15-16, epigyna; 17, internal genitalia. 18, female abdomen, dorsal.
Figs 19-22. Badumna longinquus. 19-20, female genitalia: 19, epigynum; 20, internal genitalia. 21-22, male palp: 21, ventral; 22, tibia and patella, retrolateral. Scale lines 0.2 mm.

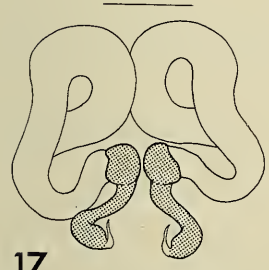

12

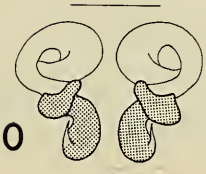

13

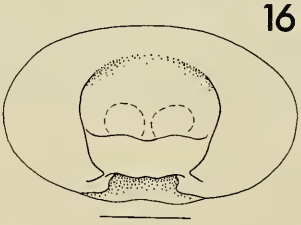

14


15

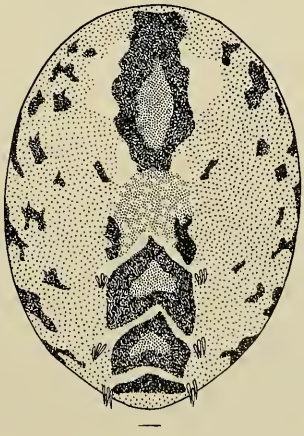

19


17


20


16


21


18


22

0.23: P.L.E. - P.M.E. 0.89: P.M.E. - P.M.E. 1. M.O.Q. length, anterior width, posterior width ratio 0.98: 0.80:1. From above anterior eye row recurved, width 0.97 mm, posterior eye row slightly procurved, width 1.09 mm.

Chelicerae: Fang groove with 2 retromarginal teeth, 4 promarginal teeth.

Maxillae: Parallel, twice as long as wide.

Labium: Wider than long in ratio 1:0.80; surface convex.

Sternum: Longer than wide in ratio 1:0.79.

Male palp: Median apophysis membranous, moderately narrow and spoon-shaped; in ventral view directed apico-laterally. Patellar process a short, bluntly pointed, finger-like projection, placed dorsally.

Legs: 1243. Spination: Leg 1, femur p 011, d 112, tibia p 101, r 101, v 122, metatarsus p 011, r 101, d 012, v 221: leg 2, femur p 001, d 213, tibia p 11, r 11, v 112, metatarsus p 101, r 101, d 012, v 221: leg 3, femur d 113, tibia p 11, r 11, v 012, metatarsus p 011, r 011, d 212, v 221: leg 4, femur d 113, tibia p 11, r 11 or 111, v 112 or 122, metatarsus p 011, r 001, d 222, v 221. Calamistrum very weak. Trichobothria (legs 1 to 4): tarsus 5, 4, 4, 3: metatarsus 5, 4, 3, 3.

FEMALE (KS 6086, A.M.)

Similar to male except as indicated below.

Measurements (mm): Body length 7.60. Carapace length 3.38, width 2.21. Abdomen length 4.45, width 2.95.

Colour: Sternum with brown hairs, white hairs absent.

Eyes: A.L.E. > P.L.E. > A.M.E. ⩾ P.M.E. in ratio 1:0.95: 0.86:0.85. Interdistance ratios, A.M.E. - A.M.E. 0.36: A.M.E. - A.L.E. 0.48: A.L.E. - P.L.E. 0.22: P.L.E. - P.M.E. 1:P.M.E. - P.M.E. 0.76. M.O.Q. length, anterior width, posterior width ratio 1:0.81:1.

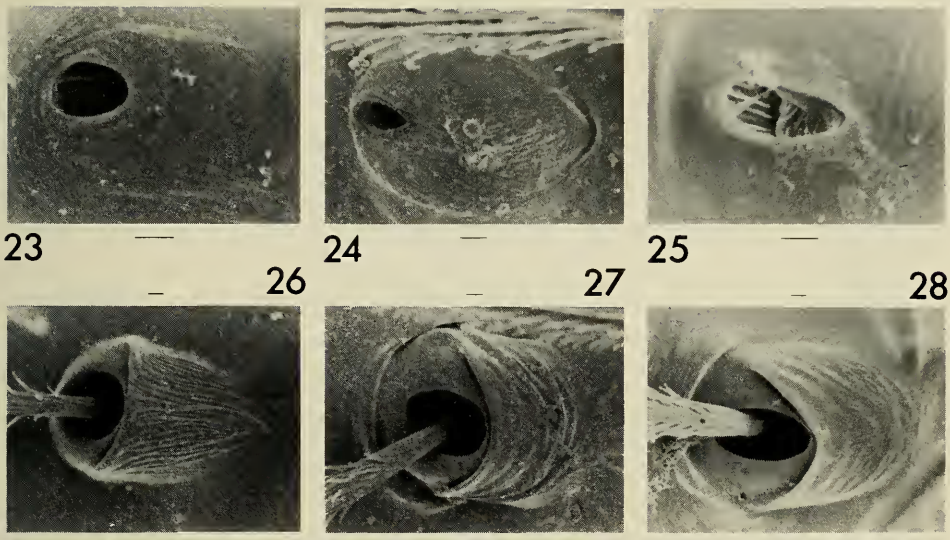
Chelicerae: Fang groove with 3 or 4 retromarginal teeth, 4 or 5 promarginal teeth.

Labium: Wider than long in ratio 1:0.75.

Sternum: Longer than wide in ratio 1:0.81.

Palp: Tarsal claw with 7-8 pectinations.

Legs: 1423. Spination: leg 1, femur p 011, d 122, tibia p 11, r 101, v 222, metatarsus p 011, r 011, d 112, v 221; leg 2, femur p 0111, d 122, tibia p 11, r 11, v 122, metatarsus p 11, r 11, d 112, v 221; leg 3, femur d 133, tibia p 11, r 11, d 212, v 221; leg 4, d 112, tibia p 11, r 11, v 112, metatarsus p 111, r 001, d 1012, v 221. Trichobothria (legs 1 to 4): tarsus 6, 4, 4, 4; metatarsus 6, 5, 4, 4. Bothria collariform, surface of proximal plate with narrow, semi-longitudinal ridges. Tarsal organ opening oval, placed near the distal margin of a poorly defined, elongate mound approximately four times as long as opening.



Figs 23-25. Tarsal organs, leg 1: 23, *B. candida* (similar in *B. gausapata*); 24, *B. vandiemeni*; 25, *B. longinquus*. *Figs 26-28.* Trichobothrial bases, tarsus, leg 1: 26, *B. gausapata*; 27, *B. vandiemeni*; (both types present in *B. candida*) 28, *B. longinquus*. Scale lines 5 μ.

Genitalia: Epigynal fossa wider than long, widest in central to posterior area, margins smoothly curved. Lateral teeth subdistal. Anterior margin of transverse ridge not indented.

Material examined

SYNTYPE females (AR 810, Paris), Victoria, 1903. 1 male (KS 6942, A.M.), Canberra, A.C.T., M.S. Upton, 24.5.1965. 5 females (KS 6086, A.M.), Black Mountain, Canberra, A.C.T., M. R. Gray, 1.10.1980. 4 males, 3 females (KS 6090, A.M.), Black Mountain, Canberra, A.C.T., 3.6.1965. 3 males, 4 females (KS 6088 A.M.), Wee Jasper, N.S.W., M. Gray 30.10.1980. 4 males (A.N.I.C.) Black Mountain, Canberra, A.C.T., I. F. B. Common, 4.6.1965 (from light trap).

Variation

Measurements (mm): Males; carapace length 3.05-3.48, width 2.19-2.61. Females: carapace length 3.38-2.44, width 2.21-1.22.

Chelicerae: Retrolateral teeth 2-3, prolateral teeth 4-5.

Spination: Leg 1, ventral tibia 122-222.

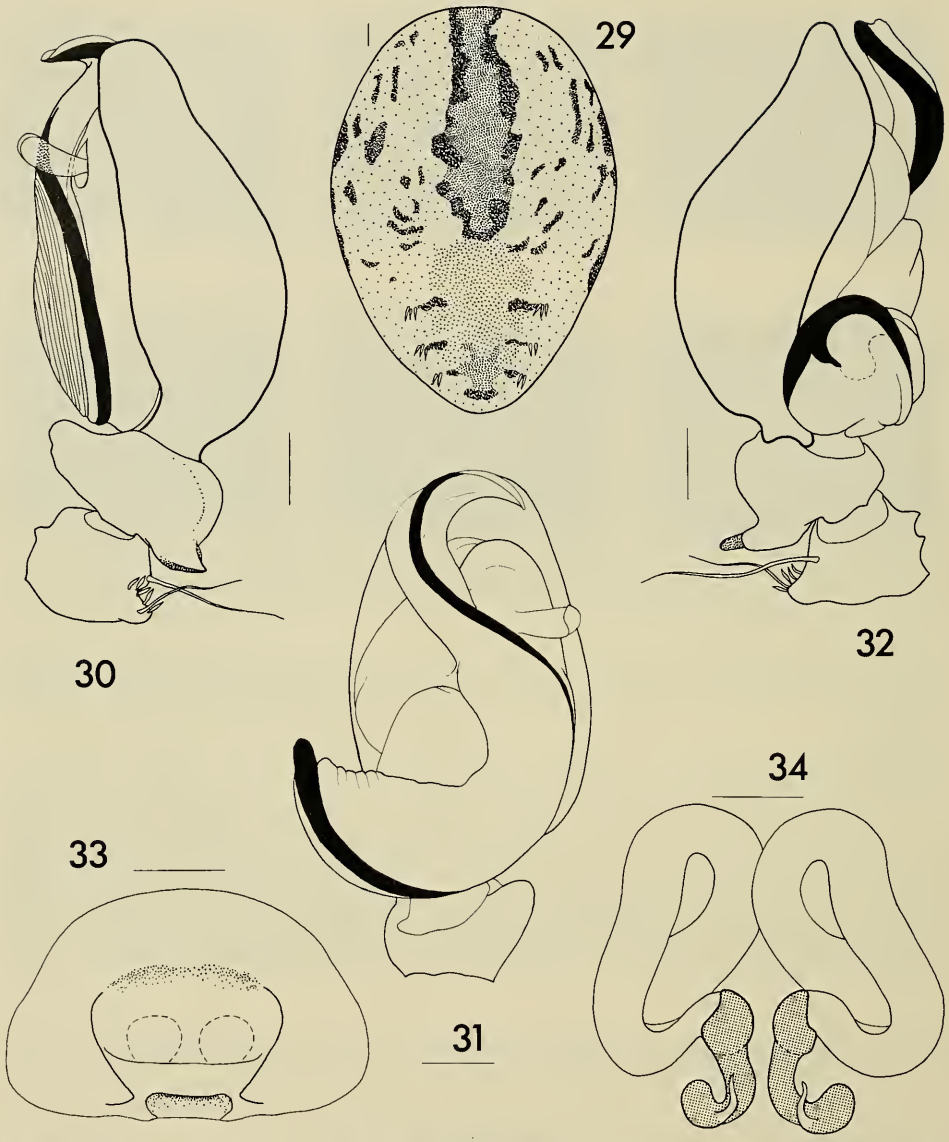
Badumna vandiemeni n. sp. Figs 24, 27, 29-34

Ixeuticus candidus Hickman 1967

Similar to *B. candida* and agreeing with the description given for that species except as indicated below.

Diagnosis

Definite patellar process on male palp; median apophysis directed laterally. Lateral teeth of epigynum subdistal; fossa widest in anterior half. Mid-dorsal abdominal colour pattern light brown posteriorly. Cheliceral teeth, retrolateral 2 and



Figs 29-34. Badumna vandiemeni. 29, male abdomen, dorsal. 30-32, male palp: 30, retrolateral; 31, ventral; 32, prolateral. 33-34, female genitalia: 33, epigynum; 34, internal genitalia. Scale lines 0.2 mm.

prolateral 4-5. Ventral tibial spination, first leg 121-222. Metatarsal trichobothria, first leg 7-9.

MALE (KS 6976, A.M.), Holotype

Measurements (mm): Body length 8.55. Carapace length 4.06, width 2.80. Abdomen length 4.58, width 3.70.

Colour: Dorsal abdominal stripe fairly long, about half as long as abdomen. Posterior chevrons indistinct, light brown except for small, lateral, dark brown patches of

pigment. Sternum with dark brown and white hairs.

Carapace: Longer than wide in ratio of 1:0.69. Clypeus height 1.25 diameters of an A.M.E.

Eyes: A.M.E. > A.L.E. > P.L.E. > P.M.E. in ratio of 1:0.95:0.92:0.84. Interdistance ratios, A.M.E. - A.M.E. 0.39: A.M.E. - A.L.E. 0.42: A.L.E. - P.L.E. 0.20: P.L.E. - P.M.E. 1.00: P.M.E. - P.M.E. 0.90. M.O.Q. length, anterior width, posterior width ratio 1:0.82:0.96. From above anterior eye row slightly recurved, width 1.20 mm; posterior eye row slightly procurved, width 1.34 mm.

Chelicerae: Retrolateral teeth 2; prolateral teeth, 4-5.

Maxillae: Subparallel, slightly convergent, twice as long as wide.

Labium: Wider than long in ratio 1:0.80.

Sternum: Longer than wide in ratio 1:0.81.

Male palp: Median apophysis moderately narrow and spoon-shaped: directed laterally, almost horizontal in ventral view. Patellar process dorsally placed, short, bluntly pointed and adorned basally with white, spatulate hairs.

Legs: 1243. Spination: leg 1, femur p 011, d 112, tibia p 11, r 11, v 222, metatarsus p 101, r 101, d 002, v 221: leg 2, femur p 0011 or 0111, d 112, tibia p 11, r 11, v 122, metatarsus p 101, r 101, d 002, v 222: leg 3, femur p 0111, d 113, tibia p 11, r 11 v 022: metatarsus p 0101, r 0101, d 112, v 221: leg 4, femur d 113, tibia p 11, r 11, v 112, metatarsus p 111, r 001, d 112, v 221. Calamistrum weak. Trichobothria (legs 1 to 4): tarsus 6, 5, 5, 5: metatarsus 7, 6, 6, 5.

FEMALE (KS 6977, A.M.), Paratype

Similar to male except as indicated below.

Measurements (mm): Body length 8.60. Carapace length 3.69, width 2.48. Abdomen length 4.95, width 3.50.

Colour: Dorsal abdominal stripe less than half as long as abdomen.

Carapace: Longer than wide in ratio 1:0.67.

Eyes: A.M.E. > A.L.E. > P.L.E. = P.M.E. in ratio 1:0.95:0.85:0.85. Interdistance ratios, A.M.E. - A.M.E. 0.42: A.M.E. - A.L.E. 0.71: A.L.E. - P.L.E. 0.23: P.L.E. - P.M.E. 0.86. P.M.E. - P.M.E. 1.00 M.O.Q. length, anterior width, posterior width ratio 1:0.73:0.99. Eye row width, anterior 1.20 mm; posterior 1.34 mm.

Chelicerae: Retrolateral teeth, 2; prolateral teeth, 4.

Labium: Wider than long in ratio 1:0.84.

Sternum: Longer than wide in ratio 1:0.85.

Legs: 1243. Spination: leg 1, femur p 0011, d 112, tibia p 11, r 11, v 121; metatarsus p 011, r 011, d 002, v 221; leg 2, femur p 0011, d 112, tibia p 11, r 11, v 121, metatarsus p 011, r 011, d 002, v 221; leg 3, femur d 113, tibia p 11, r 11, v 012, metatarsus p 011, r 011, d 002, v 221; leg 4, femur d 112, tibia p 11, r 11, v 012, metatarsus p 011, r 0011, d 002, v 121. Trichobothria (legs 1 to 4): tarsus 5, 5, 4, 5; metatarsus 9, 5, 7, 5. Bothria collariform with several, well defined, semi-circular ridges on proximal plate. Tarsal organ a small, oval opening, acutely pointed proximally, placed near the distal margin of a well delimited, oval mound six times as long as opening; surface of mound ornamented by fine striae.

Genitalia: Epigynal fossa wider than long, widest anteriorly, lateral margins sloping inwards to subdistal lateral teeth. Transverse ridge not indented anteriorly.


35


36


37

Figs 35-37. Badumna candida, webs. 35, communal web, Dubbo, N.S.W.; 36, solitary web retreat, Goonoo S.F., N.S.W.; 37, solitary web retreat of juvenile male, dark colour form, Margaret River, W.A.

Types

Holotype Male — KS 6976 (A.M.). Eaglehawk Neck, Tas., M. R. Gray, 3.7.1980; from solitary web on shrub (*Acacia uricifolia*).

Paratypes — Female, KS 6977 (A.M.), same data as holotype. Female, KS 6978 (A.M.), Eaglehawk Neck, Tas., V. V. Hickman, 6.3.1960. 3 females, J.763 (T.M.), Lauderdale, Tas., April 1971.

Variation

Measurements (mm): Females: carapace length 2.95-3.69; carapace width 1.97-2.40.

Spination: Leg 1, ventral tibia 121-222.

Biological Notes

Spiders of the *B. candida* species group make both communal and solitary webs. As noted by Main (1971) communal web populations are made up mainly of juveniles, but adults are also often present; some, at least, may complete their life cycles within the communal web. However, many leave to take up a solitary existence soon after they mature. Late instar juveniles as well as adults are involved in such dispersal as both subadult and mature spiders can be found in solitary webs.

The webs (Figs 35-37) are built among the foliage of various low, sclerophyllous trees and shrubs. Solitary webs are small, the retreat usually being fastened along a stem while the irregular cribellate snare extends a short way into the surrounding foliage. Communal webs vary greatly in size and may encompass much of the foliage of a shrub or branch. Up to 95 spiders have been recorded from a single large web. Counts of penultimate juveniles in communal webs often showed marked disproportions in sex ratios; whether this simply represents differential dispersal or involves some other factors is not clear. Though their retreat tubes are independent of each other, juvenile spiders will hunt and feed together on the same prey animal in the shared catching part of the web.

Main (1976, fig. 40e) noted that the structure of the solitary web in south western populations of *B. candida* consisted of a short, bag-like tube of silk fastened onto a branch, the small sheet web radiating out from it. Similar solitary nests are built by members of the *candida* species group in eastern Australia (Fig. 36), though sometimes

their retreat tubes are more elongated. In southwestern Australia long, horn-like retreats containing juvenile males of the dark colour form of *B. candida* (reared to maturity in the laboratory) have been collected (Fig. 37).

One to three egg sacs can be found embedded in the silk-plant-food detritus wall matrix of the female retreats. The sacs are circular to oval, flattened spheres with a definite circumferential seam varying in diameter from 4 to 7 mm. The outer silk is flocculent and attaches the sac closely to the retreat wall: inside this is a more finely woven, thin layer of silk. The eggs are non-glutinous and vary from 0.6 to 0.8 mm in diameter. Each sac contains from 13 to 49 eggs. Sacs were found in retreats from both solitary and communal webs.

ACKNOWLEDGEMENTS

My thanks go to Dr M. Hubert, Dr B. Y. Main, Prof V. V. Hickman, Dr V. Davies and Mr M. Upton for the loan of material. Inking and shading of drawings was done by Ms P. Greer.

References

DALMAS, C. de, 1917. — Araignées de Nouvelle-Zélande. *Ann. Soc. Ent. France* 86: 317-430.

DONDALE, C. D., 1966. — The spider fauna (Araneida) of deciduous orchards in the Australian Capital Territory. *Aust. J. Zool.* 14: 1157-92.

FORSTER, R. R., 1970. — The spiders of New Zealand, Pt. III. *Otago Mus. Bull.* 3: 1-184.

——, and WILTON, C. L., 1973. — The spiders of New Zealand, Pt. IV. *Otago Mus. Bull.* 4: 1-309.

HICKMAN, V. V., 1967. — *Some common spiders of Tasmania.* Hobart: Tasmanian Museum and Art Gallery.

KULCZYNSKI, V., 1908. — Symbola and faunam aranearum Javae at Sumatrae cognoscendam. I. Mygalomorphae et Cribellatae. *Bull. Acad. Sci. Cracov.* 1908: 527-581.

KOCH, L., 1872. — *Die Arachniden Australiens.* Nuremburg: Ludwig Korn.

LEECH, R., 1971. — The introduced Amaurobiidae of North America and *Callobius hokkaido* n.sp. from Japan (Arachnida:Araneida), *Canad. Ent.* 103: 23-32.

——, 1972. — A revision of the Nearctic Amaurobiidae. *Mem. Ent. Soc. Can.* 84: 1-182.

LEHTINEN, P. T., 1967. — Classification of the Cribellate Spiders and some allied families with notes on the evolution of the suborder Araneomorphae. *Ann. Zool. Fenn.* 4: 199-468.

MAIN, B. Y., 1964, 1967. — *Spiders of Australia*, (2 editions). Brisbane: Jacaranda Press.

——, 1971. — The common 'colonial' spider *Ixeuticus candidus* (Koch) and its synonyms (Dictynidae:Araneae). *J. Roy. Soc. W.A.* 54 (4): 119-120.

——, 1976. — *Spiders*. Sydney: Collins. Australian Naturalist Library.

MCKEOWN, K. C., 1963. — *Australian spiders.* Sydney: Angus and Robertson.

ROEWER, C. F., 1942-54. — *Katalog der Araneae*, 2 vols. Bremen: Wissenschaften Paul Budy.

SIMON, E., 1899. — Ergebnisse einer Reise nach dem Pacific. Arachnoideen. *Zool Jahrb., Syst.* 12: 411-437.

SIMON, E., 1906. — Étude sur les Araignées de la section des Cribellates. *Ann. Soc. Ent. Belg.* 50: 284-308.

——, 1908. — In *Die Fauna Südwest Australiens* 1 (12): 359-446 (W. MICHAELSEN AND R. HARTMEYER (eds)). Jena: Gustav Fischer.

THORELL, T., 1890. — Studi sui Ragni malesi e papuani. IV. *Ann. Mus. Civ. St. Nat. Genova* 28: 1-419.